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NASA TECH BRIEF

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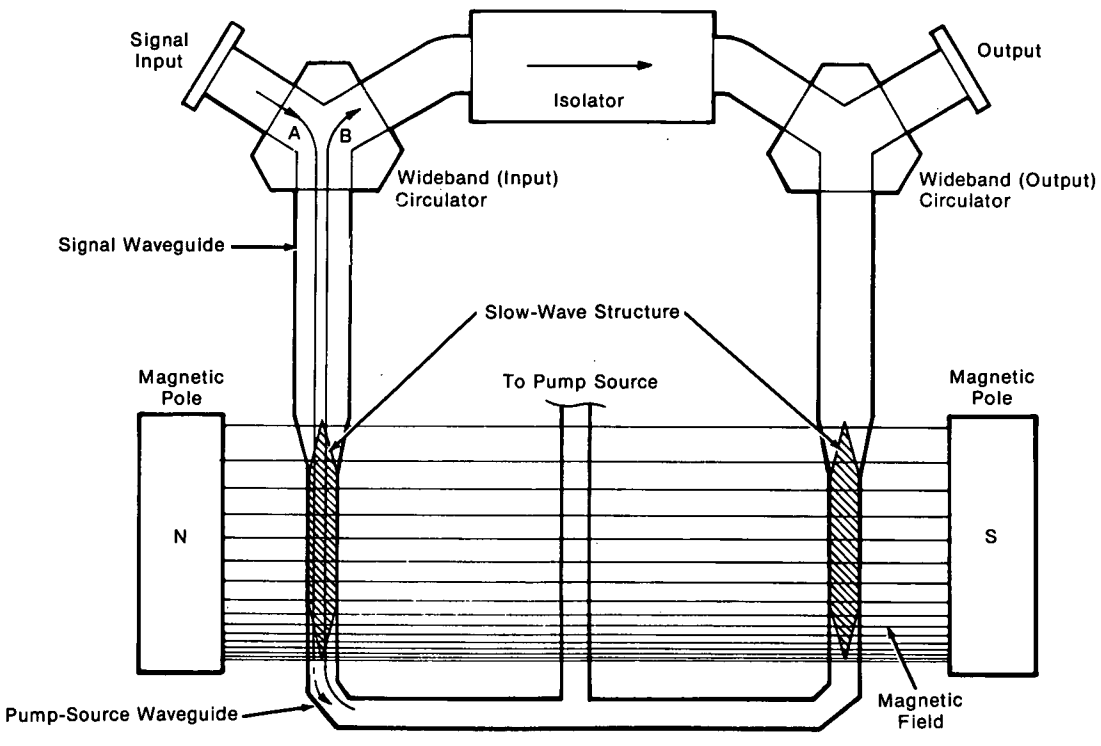
Reflected-Wave Maser

A reflected-wave maser amplifier has a significantly greater bandwidth than conventional maser amplifiers. Because of the wide bandwidth, the unit needs no retuning to receive a wide range of frequencies, and thus system reliability is improved and operator time is saved.

The maser as shown is made up of two stages. The first stage includes an input circulator connected by the signal waveguide to the maser slow-wave structure (ruby maser material). Also included is the left part of the pump-source waveguide connected to the pump source. The right side of the pump-source waveguide with the second slow-wave structure and an output circulator constitute the second stage. An isolator between the input and output circulators stabilizes maser operation when mismatched loads are connected to the circulators.

Basically, the signal (direction A) fed into the input circulator is amplified by the slow-wave structure. At the opposite end of the structure, the pump-source waveguide presents a mismatch, bouncing the signal in the opposite direction (B). This amplifies the signal again. The extra gain obtained by this second amplification is traded off for a wide bandwidth by broadening the line width of the active ruby maser material with a nonuniform magnetic field. The maser gain is increased by cascading the structure with identical amplifiers. Tests on one prototype show that its bandwidth is 10 times greater than conventional maser amplifiers.



Reflected-Wave Maser Block Diagram

(continued overleaf)

Note:

Requests for further information may be directed to:

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Reference: TSP75-10279

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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Categories: 03 (Physical Sciences)
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